

SOME EOCENE INSECTS FROM COLORADO AND WYOMING

By T. D. A. COCKERELL,

Of the University of Colorado, Boulder.

The insects described below were obtained by or for the United States Geological Survey and are now the property of the United States National Museum. Those from White River, Colorado, and Green River, Wyoming, come from the collection accumulated by S. H. Scudder many years ago. It is generally understood that all these fossils are of Green River age; but they come from different horizons, evidently by no means contemporaneous. It is a matter for the future to minutely study the series of rocks ascribed to the Green River period and determine what subdivisions are necessary. These strata are of peculiar interest at the present time, as they include oil shales, which are expected to prove of great economic importance.

ORTHOPTERA.

Family GRYLLIDAE.

PRONEMOBIUS ORNATIPES, new species.

Plate 8, fig. 8.

Length, 11.5 mm.; width of abdomen, 5.5 mm.; anterior femur, about 2.7 mm.; hind femur, 7 mm.; hind tibia, about, 5.4 mm.; width of hind femur, 2 mm. Anterior femora dark above, but below or posteriorly with a large colorless patch, notched in front and behind, and near the apex with a small spot. Middle femora with the same marks, except that the large spot is almost or quite divided into two elongate ones. Hind femora with oblique stripes as in modern *Nemobius*, but I can not see any hairs. Each side of abdomen with a series of transverse spots, each connected in the middle with the next, forming a longitudinal moniliform band. Ovipositor apparently quite short, exerted about 2.5 mm.

Eocene. "Cathedral Bluffs south of Little Tommies Draw, at point where samples were taken." (Winchester 17-5; U. S. G. S.) Colorado. Certainly very close to *P. tertiaris* Scudder, but larger throughout, and probably distinct. Scudder's insect came from the Green River of Wyoming. Scudder does not describe any marking of the anterior and middle femora of his species, but his figure indi-

cates that there was some banding. The ovipositor in *P. ornatipes* is considerably shorter than in *P. tertiaris*, so that at first I wondered whether it was all there; but one of the two impressions is very distinct and I feel sure it is complete.

Holotype.—Cat. No. 66918, U.S.N.M.

ODONATA.

Family LIBELLULIDAE.

STENOGOMPHUS (?) SCUDDERI, new species.

Plate 8, figs. 5, 9.

Female.—Abdomen stout, cylindrical, about 28 mm. long from base of second segment to end of appendages, depth (width in lateral view) about 3.5 mm., uniform to near apex; color as preserved dark brown, second segment with faint sublateral pale marks, segments 3 to 7, with sublateral longitudinal colorless bands, ending abruptly on each segment about 1 mm. from the posterior margin, the band on the seventh segment shorter and less distinct; appendages about 2.5 mm. long, spear-head shaped (but sides mainly parallel), pointed. The segments measure along the dorsal surface as follows, in mm.: (2) 3.5, (3) 4, (4) 4, (5) 4, (6) 4, (7) 3.8, (8) 2, (9) 1.5, (10) 1. In another specimen (No. 1417), showing only a few segments, the measurements are (6) 4, (7) 4, (8) 2.5, (9) 1.5, (10) 1. It is from this specimen that the appendages are measured. There is a large, oblique, thornlike process beneath the eighth and ninth segments.

Eocene. Type, U. S. G. S. 834 (reverse 752), Green River, Wyoming. No. 1417, showing complete appendages, is recorded as from White River, Colorado; but it is in exactly the same kind of rock, and I suspect that it also came from Green River. Another fragment is 787, from Green River.

This is apparently one of the Corduliinae, closely related to *Soma-tochlora*, but with a more primitive abdominal color pattern. Scudder's genus *Stenogomphus*, based on a wing from Roan Mountain, Colorado, falls in exactly the same vicinity, so there is no apparent reason why the present insect should not be referred to it.

Holotype and paratype.—Cat. Nos. 66919, 66920, U.S.N.M.

DIPTERA.

Family EMPIDIDAE.

RHAMPHOMYIA (?) ENENA, new species.

Plate 8, fig. 7.

Female.—Length, 3 mm.; wings about 3 mm.; thorax about 1 mm. long, elevated, with thin rather long hair (as in the living *R. sudigeronis* Coquillett, from Palo Alto, California); general color dark brown as

preserved, the head darkest; wings slightly dusky, not spotted, venation apparently normal for the genus, anterior cross-vein not far from base of discal cell; proboscis rigid, longer than depth of head; oral region showing many short dark bristles and one long one; legs unusually stout, especially the hind femora and tibiae; hind legs quite thickly beset with short hairs.

Eocene. "Cathedral Bluffs south of Little Tommies Draw at point where samples were taken" (Winchester 17-5; U. S. G. S.) Colorado. The very small size and thick legs are peculiar, but the living *R. compta* Coquillett is as small, and the legs in the different species of *Rhamphomyia* (see, for instance, those in Baltic amber) show much diversity. It therefore seems best not to propose a new generic name. There is a rather strong resemblance to the fossil *Microphorus defunctus* Handlirsch, from British America (Tulameen River), but our insect is smaller, with the hind femora very much more robust.

A detached wing, a little over 3 mm. long, is from Roan Mountain, Colorado (Scudder; U. S. G. S. 52). So far as can be seen, it agrees with *R. enena*. It shows the well-developed anal lobe, broadly rounded and not projecting backward.

Holotype.—Cat. No. 66921, U.S.N.M.

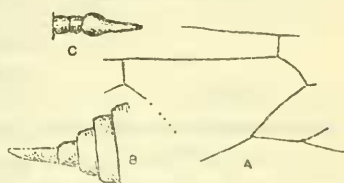


FIG. 1.—RHAMPHOMYIA ENENA. A. PART OF WING. B. END OF ABDOMEN. C. ANTENNA.

Family ASILIDAE.

ASILUS PALAEOLESTES, new species.

Female.—Length, nearly 14 mm.; black, the wings hyaline, with dark veins; abdomen robust; legs spinose as in living forms. Veins

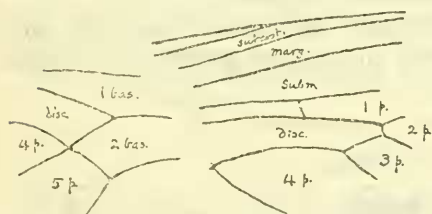


FIG. 2.—ASILUS PALAEOLESTES. DETAILS OF WING.

before end of discal cell.

Eocene; White River, Colorado. (U. S. G. S. 391.) So far as can be seen, this insect is entirely of a modern type.

Holotype.—Cat. No. 66922, U.S.N.M.

bounding end of second basal cell and base of fourth posterior forming a cross, as in *Asilus* (*Tolmerus*) *notatus* Wiedemann; discal cross-vein oblique, its lower end 1,280 μ beyond level of base of fourth posterior cell, 480 μ before basal corner of third posterior, and 1,090 μ be-

Family STRATIOMYIIDAE.

SARGUS (?) VETUS, new species.

Plate 8, fig. 3.

Probable length not less than 10 mm., the apical part of abdomen lost, the parts preserved measuring a little over 8 mm.; wings fully 7 mm. long. Head, 3 mm. broad, with the hemispherical shape (seen from above) and large eyes of the modern *Sargus*; occiput pallid; thorax, 3.4 mm. long and about 2.2 mm. broad (considerably narrower than head), dorsally dark, as far as scutellum (which is unarmed), but apparently pallid at sides, especially posteriorly; wings hyaline, with only a faint cloud in the stigmatic region; venation difficult to make out in detail, the accompanying figure may not be entirely correct, but it shows what could apparently be seen; abdomen pale, without markings, covered with fine short hair, the base at least as broad as thorax, not at all contracted. The pallid sides of thorax may be observed in some modern Stratiomyiidae, such as *Odontomyia truquii* Bellardi, which I have taken at Roswell, New Mexico, and have from Santa Clara County, California (Baker).

FIG. 3.—SARGUS VETUS. PART OF WING.

Eocene; White River, Colorado (U. S. G. S. 682). This can not well be separated from modern *Sargus* on the basis of the visible structures, but it very possibly represents an extinct genus, with perhaps some characters of the Beridinae, suggested by certain details of the venation. The generic name *Sargus* is to be used in preference to *Geosargus* Bezzi, because *Sargus* Klein, supposed to preoccupy *Sargus* Fabricius, was not binomial.

Holotype.—Cat. No. 66923, U.S.N.M.

NEMOTELUS (?) EOCENICUS, new species.

Only abdomen and wing preserved. Abdomen broad (4.2 mm. wide), shaped as usual in *Nemotelus* and related genera, with lateral cuneiform pale markings as shown in the figure, quite in the manner of modern forms. Wing probably about 8 mm. long (from base to end of discal cell 5.2 mm.), hyaline, with the strong veins dark. Venation as in modern *Nemotelus*, so far as visible, except that the fourth vein before the discal cell is distinctly arched (compare *Euparyphus* and *Rhaphiocera*).

Discal cell on first posterior 800 μ . Other details are sufficiently indicated in the figure. The anal cell is closed, and formed as in *Nemotelus*.

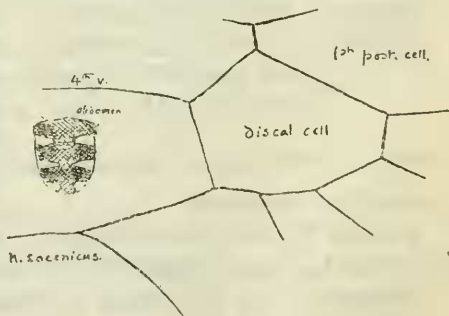


FIG. 4.—NEMOTELUS EOCENICUS. ABDOMEN AND PART OF WING.

Eocene. U. S. G. S. 367; White River, Colorado. This is clearly one of the Clitellarinae, and is referred to *Nemotelus* because that is one of the dominant genera, and the characters do not distinctly contradict the reference. It is very likely, however, that if we knew the antennae and scutellum it would be possible to recognize a distinct type, now extinct.

Holotype.—Cat. No. 66924, U.S.N.M.

Family MUSCIDAE (sens. lat.).

ACANTHOMYITES, new genus.

Rather stout flies of moderate size, with thick (deep, not narrowly cylindrical) abdomen; wings not preserved in the type. Characterized by the great number of large dark bristles on head, abdomen and legs.

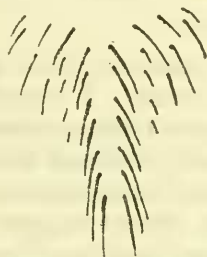


FIG. 5.—ACANTHOMYITES ALDRICHI. DIAGRAMMATIC FIGURE OF DORSAL BRISTLES OF THORAX.



FIG. 6.—ACANTHOMYITES ALDRICHI. ANTERIOR LEG.

The largest are the acrostichals on thoracic dorsum, but the dorsocentrals appear to be very small. An attempt has been made in the accompanying figure to diagrammatically show the distribution of the dorsal thoracic bristles, but it is not exact, and the sutures can not be seen at all. The bristles on abdomen, head, and legs are smaller than the acrostichals; there is the usual row on the underside of the anterior femora.

Type.—*Acanthomyites aldrichi*, new species.

ACANTHOMYITES ALDRICHI, new species.

Plate 8, fig. 12.

Length, nearly 6 mm.; as preserved brown, the sides of the abdomen pallid. Head rather small; legs of moderate length, not especially robust.

Eocene. "Cathedral Bluffs south of Little Tommies Draw at point where samples were taken." (Winchester, 17-5; U. S. G. S.) Colorado. Named after Dr. J. M. Aldrich, who examined it when visiting my laboratory, and agreed that such an interesting form ought to be recorded, in spite of the loss of the wings and other important features. It is certainly a striking circumstance that the system

of large bristles characteristic of the higher flies should have been so fully developed as far back as the Eocene. To-day this development of large bristles is more especially characteristic of forms which have larvae parasitic on other insects; but it would be going too far to affirm that *Acanthomyites* was necessarily parasitic. Doctor Aldrich writes: "I do not recall any cases among existing flies where the dorsocentral bristles are reduced, and at the same time the anterior acrostichals are larger than common, or in fact larger than the dorsocentrals."

Holotype.—Cat. No. 66925, U.S.N.M.

HOMOPTERA.

Family FULGORIDAE.

DELPHAX (sens. latiss.) VETERUM, new species.

Plate 8, fig. 6.

Length about 3.5 mm.; tegmina 4.3 mm. long and 1.8 mm. wide; fuscous, except the metathorax, basal 0.5 mm. of abdomen, and last two abdominal segments (except laterally), which are colorless; body stout, abdomen nearly 1.5 mm. wide; head short, obtuse; scutellum large, very distinctly tricarinate, its lateral margins only very feebly concave; tegmina broad, with convex costa, the shape and dark color suggestive of Cercopidae. The details of the venation can not be made out, but the little that can be seen, both on tegmina and hind wings, agrees sufficiently with Delphacinae.

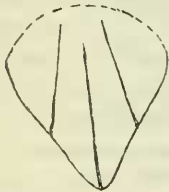


FIG. 7.—DELPHAX VETERUM. SCUTELLUM.

In the hind wing the median cell ends broadly in the usual manner. Eocene; "Cathedral Bluffs south of Little Tommies Draw at point where samples were taken." (Winchester 17-5, U. S. G. S.) Resembles *Delphax senilis* Scudder, from the White River Eocene, but is larger. I follow Scudder in using the name *Delphax* in a broad sense, as it is not possible to determine the genus accurately. The sides of the scutellum are straighter than in the majority of modern American Delphacinae.

Holotype.—Cat. No. 66926, U.S.N.M.

HETEROPTERA.

Family PENTATOMIDAE.

DINIDORITES, new genus.

Narrow for Pentatomidae, the general outline suggesting *Margus* in the Coreidae; head prominent, broad, obtuse; antennæ four jointed, the joints darkened apically, pallid basally; pronotum short, fully twice as broad as long, broadly rounded laterally, not angulate; scutellum large but not reaching to middle of abdomen; pronotum

and scutellum with numerous dark punctures; abdomen with dark lateral spots marking the junction of the segments, the margin distinctly projecting at these points.

Type.—*Dinidorites margiformis*, new species.

DINIDORITES MARGIFORMIS, new species.

Plate 8, fig. 10.

Length, 9.6 mm.; head, 1.6 mm. long and about 2 mm. broad; antennae, 4.8 mm. long, the first two joints pale with the apex narrowly dark, the others broadly darkened; pronotum about 2 mm. long and 4 mm. broad, with three pallid lines joined transversely at posterior end by a curved one; scutellum broadly triangular, sides longer than base, length about 3 mm.; abdomen about 4.6 mm. wide near base, its apex over 3 mm. from end of scutellum.

Eocene; "Cathedral Bluffs south of Little Tommies Draw at point where samples were taken." Colorado. (Winchester 17-5, U. S. G. S.)

The Dinidorinae include 10 living genera, widely scattered over the earth. The character of the short scutellum was especially noted by Scudder in his studies of the American fossil Pentatomidae. The present genus has the narrow form of *Byrsodepsus*, but the pronotum is much more like that of *Cyclopelta*. The abdominal margin is like that of *Byrsodepsus*. Aside from the scutellum, there is a curious resemblance to *Pentatoma appendiculatum* Heer, at least in the marking of the pronotum and abdomen. There is probably no real affinity; the true generic position of Heer's fossil is unknown.

Holotype.—Cat. No. 66927, U.S.N.M.

COLEOPTERA.

Family CARABIDAE.

LEBIA PROTOSPILOPTERA, new species.

Plate 8, fig. 2.

Elytron 3.7 mm. long, about 1.4 mm. broad; shape as usual in the genus, the apex broadly truncate as in *L. divisa* LeConte; nine very distinct delicate striae, under a high power resolved into series of punctures, and a short (about 550 μ long) stria at the inner basal corner; a series of large round punctures, appearing colorless on a dark ground, situated as follows: One near the apical margin, about 240 μ from the inner corner; two, close together, near the rounded outer apical corner; seven in the interval between the first and second striae, counting from without, and mostly touching the second stria. Elytron as preserved brown, with a very large subquadrate colorless humeral patch, extending as far as the second stria from the inner margin, and with a large colorless subapical patch, one side of

which is along the inner margin, while its outer margin is more than halfway to outer margin of elytron.

Eocenes. "Back of house at Smith's ranch, shale of Green River formation with thin beds oil-shale interbedded." (Winchester 17-3. U. S. G. S.). Colorado. A pretty little species, congruous with modern *Lebia* in every respect. A species of *Lebia* (*L. amissa* Heyden) has been recorded from the Oligocene of Germany.

Holotype.—Cat. No. 66928, U.S.N.M.

Family SCARABAEIDAE.

MELOLONTHITES AVUS, new species.

Plate 8, fig. 4.

A melolonthoid beetle preserved in ventral view, without the head. Length as preserved about 13 mm., of which 5 mm. is posterior to the hind legs; width in region of hind legs about 7 mm.; all the femora very robust, the hind ones fully 1.5 mm. across; middle legs contiguous at base; middle tibiae about 2.4 mm. long, not specially enlarged or spinose, but with well-developed spurs; first joint of middle tarsus only about 6 mm. long, second and third joints shorter; hind tibiae simple, with a longitudinal ridge, apex moderately expanded, ending in a short spine externally.

Eocene. U. S. G. S. 894, White River, Colorado. Heer used the term *Melolonthites* for fossil melolonthine or Pleurostict Scarabaeidae of uncertain generic position. The present insect is of interest as indicating the existence of this type of beetle in the American Eocene.

Holotype.—Cat. No. 66929, U.S.N.M.

Family CALANDRIDAE.

SCIABREGMA TENUICORNIS, new species.

Plate 8, fig. 1.

Length, 5.6 mm.; prothoracic process extending about 640 μ beyond head, fingerlike, slender, and curved, fully three times as long as thick; eyes rather large and round; beak as in *S. rugosa* Scudder; upper margin of prothorax straight in lateral profile, front of head to posterior end of prothorax 2 mm.; surface of prothorax rugosopunctate; legs apparently as in *S. rugosa*; elytra 3 mm. long and 1.5 wide, with nine rows of very distinct punctures; about the middle the rows are a little more widely separated than the consecutive punctures in a row, and the interval between the latter is about equal to the width of a puncture.

Eocene of Colorado. "Back of house at Smith's ranch, shale of Green River formation, with thin beds oil-shale interbedded." (Winchester 17-3. U. S. G. S.). In white rock. A beautifully preserved specimen, evidently congeneric with Scudder's *S. rivaosa* from Roan

Mountains, but apparently quite distinct by the long slender thoracic process. At first I wondered whether this could be illusory, and the apparent process be a leg elevated behind the head; but closer inspection negatives this, and moreover, as in Scudder's insect, both legs can be seen in the usual position.

Holotype.—Cat. No. 66930, U.S.N.M.

HYMENOPTERA.

Family ICHNEUMONIDAE.

TILGIDOPSIS, new genus.

Similar in general appearance and venation to the oriental genus *Tilgida*, but apparently falling in or closely related to the Paniscini.

Stigma lanceolate, not much broadened; radius sharply angled, V-like at first intercubitus; no areolet; basal nervure nearly meeting nervulus. Body rather slender, the abdomen slender basally, broadly banded; terebra exerted a short distance.

The terebra is not well preserved, and I am not sure that it is correctly described, but it seems to be clearly present and exerted. In the Paniscini, the genera *Opheltoideus* Ashmead and *Parca* Morley lack the areolet, but our insect can hardly be associated with either. It is probably significant that *Tilgida* Cameron, of which the female is unknown, is of uncertain position owing to its lack of distinctive features. It may perhaps be an ancient type, really related to our fossil.

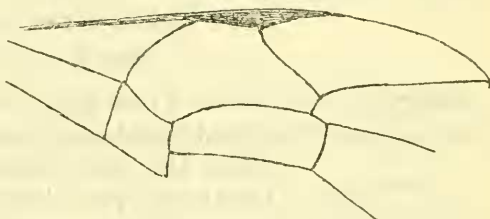


FIG. 8.—TILGIDOPSIS HAESITANS. WING.

Type.—*Tilgidopsis haesitans*, new species.

TILGIDOPSIS HAESITANS, new species.

Female.—Length about 8 mm.; anterior wings slightly over 5 mm., hyaline, with the apical half faintly dusky; stigma and veins dark; head and thorax black or dark brown; abdomen slender, with alternating broad light and dark bands; ovipositor apparently exerted about 1 mm. beyond abdomen. Marginal cell 2560 μ long; first brachial cell 1280 μ long.

Eocene: White River, Colorado (U. S. G. S. 676). Among the Eocene species, this resembles *Ichneumon petrinus* Scudder in many respects, but Scudder's insect is too imperfectly preserved to be placed generically.

Holotype.—Cat. No. 66931, U.S.N.M.

Family FORMICIDAE.

EOFORMICA, new genus.

Male (apparently).—Of fair size, but with the head small; eyes well developed, convex, placed high up, almost on vertex; mandibles thick, with at least three sharp terminal teeth; thorax massive, elevated, unarmed, the dorsal profile in lateral view sharply elevated in front and gradually descending posteriorly; wings not preserved; legs slender, with very long femora; petiole of abdomen rather long, gibbous but not much elevated above the highest point (which is broadly rounded in lateral profile) behind the middle; gaster short and rounded.

Type.—*Eoformica eocenica*, new species.

EOFORMICA EOCENICA, new species.

Plate 8, fig. 11.

Length 7 mm.; thorax 3 mm. long; abdomen 3.1 mm. of which 2.2 mm. is gaster; length of hind femur about 3.4 mm. Eyes $335\ \mu$ long, about the same distance apart but about $540\ \mu$ from mandibles. Body apparently not hairy. The suture at the base of the metathorax is impressed.



FIG. 9.—EOFORMICA EOCENICA. RESTORATION OF HEAD.

Eocene. "Back of house at Smith's ranch, shale of Green River formation, with thin beds of oil shale interbedded" (Winchester 17-3, U. S. G. S.). Colorado. On the same piece of rock as the type *Lebia protospiloptera*, and 17 mm. from it.

This may possibly be identical with Scudder's *Liometopum pingue* from White River, Utah. The pedicel in Scudder's insect appears to be different, but it is seen in the dorsal aspect. The length of hind femora, given as 4.3 mm. by Scudder, must be a misprint, possibly for 3.4. It is certain that our insect is not related to *Liometopum*.

I offer a new generic name for this insect, which seems to be a primitive type related to *Oecophylla*; the small head suggests a male. The pedicel, gaster, and slender legs are quite like those of *Oecophylla*; but the mandibles appear to differ, and if the specimen is a male, the pedicel is very thick for the living genus. *Oecophylla* is an Old-World genus, so far as at present known.

I have attempted a restoration of the head of *Eoformica*, omitting those structures which can not be seen in the fossil. The ocelli are between the eyes instead of far above them as in males of *Camponotus* and *Formica*. The margin of the clypeus seems to be denticulate.

Holotype.—Cat. No. 66932, U.S.N.M.

DESCRIPTION OF PLATE 8.

- FIG. 1. *Sciabregma tenuicornis*, new species $\times 3$.
2. *Lebia protospiloptera*, new species.
3. *Sargus vetus*, new species $\times 1.5$.
4. *Melolonthites avus*, new species $\times 2$.
5. *Stenogomphus scudderi*, new species $\times 2$.
6. *Delphax veterum*, new species $\times 4$.
7. *Rhamphomyia enena*, new species $\times 4$.
8. *Pronemobius ornatipes*, new species.
9. *Stenogomphus scudderi*, new species $\times 2$.
10. *Dinidorites margiformis*, new species.
11. *Eoformica eocenica*, new species.
12. *Acanthomyites aldrichi*, new species $\times 6$.